GEO/GGOS Workshop demonstrated contribution of geodetic observations to understanding and assessing geohazards, mitigation, and prevention of disasters

Hans-Peter Plag, Nevada Bureau of Mines and Geology, University of Nevada, Reno

The Workshop "The GGOS Contribution to GEOSS and an Observing System for Geohazards and Disaster Prevention" took place on October 5-6, 2007, at the ESA Facility ESRIN in Frascati, Italy, as part of the International Geohazards Week (see http://earth.esa.int/workshops/2007Geohazards).

About 50 participants from both the geodetic and geohazards communities heard more than 20 presentations, many of them invited, and took part in related discussions. The Workshop is documented at http://geodesy.unr.edu/ggos/ggosws_2007/ along with most of the presentations. The main objective of the workshop was to reach out from the Global Geodetic Observing System (GGOS) to the space agencies and the geohazards communities. The Workshop was organized into an opening session and three topical sessions.

In the opening session, representatives of space agencies (ESA. NASA, and ASI) and the Secretariat of the Group on Earth Observations (GEO) strongly emphasized the fundamental importance of the geodetic reference frames (the International Celestial Reference Frame (ICRF), the International Terrestrial Reference Frame (ITRF), and Earth rotation parameters) as a basis for satellite missions and Earth observation. The infrastructure integrated under the umbrella of GGOS was identified as a core element in the global Earth observation system of systems.

GGOS, which builds upon the Services of the International Association of Geodesy (IAG) was considered as an example of successful international cooperation and coordination on the basis of best efforts, which can be used as an example for GEO.

Session 1 addressed the main contributions of GGOS to Earth observations. GGOS is a complex organization and an observing system with many contributors and activists relying on infrastructure maintained to a large extent by others (including the space agencies and national authorities). The ITRF is of monumental importance for understanding the Earth system and global change and for reducing the impact of global change and geohazards on society. The (already high) accuracy of the ITRF is still a key limitation in quantifying global change processes such as sea level changes and changes in the ice sheets. Improvements of the ITRF are a key step towards a better understanding of these processes and their impact on society. A key scientific and technological challenge for GGOS is consistency across the three areas of geodesy (geometry, gravity, and rotation) and between observations and models. In order to ensure that GGOS reaches its ambitious accuracy goals a strong, integrated approach to the development of techniques and infrastructure, conventions, data processing, modeling, and interpretation is needed.

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The President of the Italian Space Agency (ASI), G. Bignami, emphasized in his presentation ASI's past and present contribution to the infrastructure used by GGOS, including the laser ranging satellite LAGEOS. Photo: R. Neilan.

Session 2 illustrated the contribution of geodetic observations to the understanding of Earth system process, in particular those related to mass transport and geohazards. At seasonal time scales, mass redistribution in the fluid envelop of the Earth is well constrained by geodetic observations. The satellite gravity mission GRACE brought huge progress in monitoring time-variable gravity and facilitated significantly improved understanding of the underlying mass redistribution (mainly in the water cycle), but separation of the different processes requires combination of the full suite of geodetic observations with sufficiently complex models. Global change and geohazards phenomena are inherently linked with the reference frame, and a combination of physical models and geodetic observations may be required in order to facilitate a better understanding of these phenomena. Session 3 focused on the contribution of GGOS to the understanding of the processes causing geohazards and the potential contribution to prediction and early warning. Systems aiming at prediction of geohazards and early warning work best if they are mutually informed and consistent. GGOS has the necessary breadth to cover both roles. InSAR is extremely versatile for the early detection of hazardous areas and therefore can enable informed decisions on where to invest in dedicated monitoring systems. GPS studies in tectonically active regions reveal the existence of nearly periodic slow seismic events accounting for significant energy release. GPS studies also show upward traveling seismic waves in the atmosphere.

Thus, remote sensing of seismic waves and tsunamis from space appears possible and could be a component in early warning systems for tsunamis. GRACE senses gravity signals associated with large seismic event, and it was proposed that gravity measurements from space might help to mitigate the lack of geodetic infrastructure on the ocean floor. Although geodetic techniques provide excellent observations of surface displacements, in many cases the understanding of the link between the geodetic parameters and subsurface dynamics is not at the same level and needs to be developed.

In summary, the workshop underlined the vast contribution of geodetic observations to Earth science, Earth observations, and practical applications in the field of geohazards, including a role in early warning systems. However, there is a need to better link the providers (GGOS and the geodetic communities) to users in geohazards assessments, mitigation, early warning, and disaster prevention and recovery.

Contact:
Hans Peter Plag,
Nevada Bureau of Mines and Geology,
University of Nevada
E-mail: hpplag@unr.edu
GGOS website: http://www.ggos.org/

The Session on GGOS Contribution to Geohazards was opened by a key note on "Realizing the potential of GGOS for Geohazard Prediction and Early Warning", which was presented by G. Blewitt. The Session was chaired by S. Marsh, Co-Chair of the IGOS-P Geohazards Theme, and H.-P. Plag, one of the GGOS Vice-Chairs.
Photo: R. Neilan.